

# Open Data - Increased Use of Official Statistics

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## Abstract

*Providing official statistics as open data has been a key priority for Statistics Sweden for some years, in line with national and European open data strategies. Statistics Sweden initiated this work in 2017 by putting official statistics in the context of open data, with a user-centric approach guided by international examples. Since then, the ambition has been to provide official statistics as open data “that are of high quality, are well documented, respect data privacy concerns, are free and are easily accessible and usable” (UN seminar, 2017).*

*An inventory at Statistics Sweden in 2018 showed which statistics was already provided as open data (through our statistical database) and which statistics had a potential as open data, typically standardized commissioned services with a lot of subscribers. “Raw data” or microdata was considered out of scope. Based on the inventory, funds were re-allocated to enable adding several tables to the database 2020-2021, primarily local-level statistics on population by sex, age, income, education etc. These new tables also introduced a new local-level geography called DeSO (Demographic Statistical Areas), a division of the 290 municipalities into 5 984 smaller areas. Privacy concerns and the possibility to combine these new datasets with other open data guided the level of detail of the statistical content.*

*Other actions in 2020-2021 have been to automate DCAT-AP metadata from the statistical database so that all datasets are accessible from the national Data Portal and to differentiate the licensing of our open data. This enables flexible use of Statistics Sweden’s open data by Wikimedia and others, so that official statistics is easier to find on Google. The next goal is to make official statistics from the whole National Statistical System available as open data on the national Data Portal, enabling increased use and reuse.*

**Keywords:** Open data, Local-level statistics

## 1. Introduction

Today open data is an important part of national data ecosystems, and official statistics can be regarded as open data of “gold standard” from a data user perspective – when looking for high quality information to guide policy development or decisions. A data ecosystem also contains of data with restricted access, for

example “raw data” or “micro data” used for statistical production, research or other purposes.

Providing official statistics as open data has been a key priority for Statistics Sweden for some years, in line with national and European open data strategies. Open data is data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and share alike (Open Knowledge Foundation). When Statistics Sweden initiated this work in 2017, we started by putting official statistics in the context of open data, having a user-centric approach guided by international examples. Our guiding principle has been to provide official statistics as open data “that are of high quality, are well documented, respect data privacy concerns, are free and are easily accessible and usable” (UN Seminar, 2017).

The results from 2017 (SCB, 2017) showed that Statistics Sweden provided a lot of statistics and geospatial information as open data already, easily accessible from our statistical database, our website (frequently requested tables) and from the national geoportal. Our regional official statistics had until then only been provided on county and municipality level, with a few exceptions, so one main goal was to add statistical tables with local-level statistics in the statistical database together with digital boundaries for local-level geographies in the geoportal.

Guided by the principles cited above, with a focus on quality and integrity, we produced a list of commissioned services in 2018 (SCB, 2018) with a potential to become open data, typically standardised tables with efficient production setup and a lot of subscribers – often with local-level statistics. “Raw data” or microdata was considered out of scope.

With open data as one of our key priorities, we were also looking for ways to share ideas and learn from colleagues in other countries. In 2018 UN Statistical Commission established a Working Group on Open data (UN, 2018), where Sweden proposed to include work on guidance how to produce local-level statistics as open data with a user-centric approach. This would enable countries in following up the 2030 Agenda for sustainable development, where several the targets rely on statistics with geographic detail.

The study presented in this paper refer to a working method on how to produce local-level statistics as open data, detailed by the UN Working Group on Open data and presented at the UN Statistical Commission 2020 (UN, 2020). The results reflect lessons learnt when Statistics Sweden implemented the method when starting to produce local-level statistics on a new geographic division. The paper concludes with a discussion on next steps and challenges ahead.

## **2. The UN Open Data Working Group study “Local-level statistics as open data”**

Statistics at the local level describe the population living in geographical areas such as neighborhoods, urban or rural areas, census districts, electoral districts or grids. The data sources for compiling local-level statistics may be the population and housing census, administrative records and geospatial information.

Local-level official statistics can uncover local disparities beyond regional or national averages, which is useful and can help in building trust in public information. Local-level data is important for policymaking and often underpins the decision making of civil society and service delivery from central and local government. It is also helpful for better decision making by the private and charitable sectors.

For National Statistical Institutes, NSIs, to have local-level official statistics as high-quality open data, the effort will need to be user-oriented, with a fit-for-purpose perspective. However, there might be a risk of being too conservative in putting out such statistics as open data. Statistics describing the population living in a small area almost always need disclosure control and if overly protective disclosure methods are applied, there might not be any useful value provided by the official statistics left.

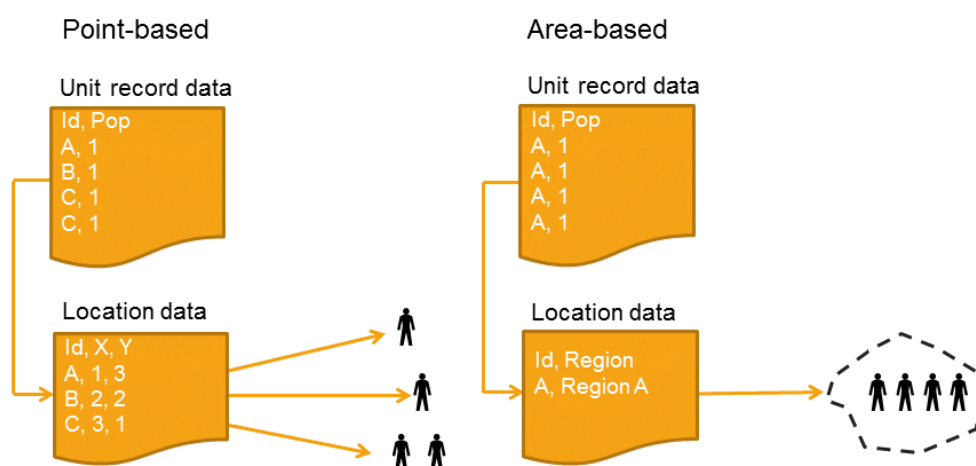
The NSI needs to investigate which statistical content users are interested in, suitable geographies, measures for disclosure control, which tools to choose for visualizations and how to setup open data access. Implementation could be carried out with a stepwise approach, interacting with users and intermediaries (open data consumers and developers) along the way.

The UN Open Data Working Group background paper resulted in advice on four aspects of local-level statistics as open data: geography, content, finding a balance

between utility and privacy and increased visibility for local-level statistics leading to increased use.

*Geography: Choosing the right geography for local-level official statistics*

The starting point for most NSIs will be to publish local-level official statistics as open data on geographies that are already existing, in many countries population and housing censuses is the best source. If the NSI has census data collected with a geographic reference to an area (e.g. census district) then producing local-level statistics is less flexible than if data is collected with a geographic reference to a point (e.g. building coordinate).



*Figure 1: The difference between point-based and area-based geographic references (GEOSTAT 2, 2017).*

With statistical data linked to geographic points you can create several different output geographies. The output geographies need to be designed to provide statistical content that is useful after applying disclosure control. You also need to be aware of risks when releasing overlapping geographies (it should not be possible to disclose information on single individuals/households when overlaying various geographies). This risk is about geographical differencing and can be illustrated in the figure below.

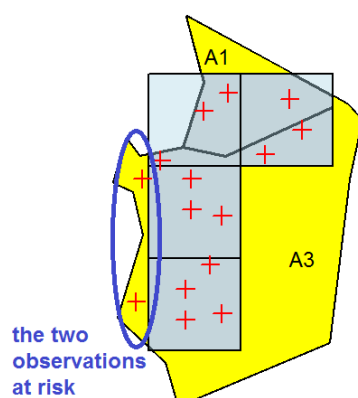


Figure 2: Example with overlapping geographies and observations at risk of disclosure (Costemalle V, 2019).

Use of a common set of geographies will ensure that all statistical data is consistently geospatially enabled and that users can discover, access, integrate, analyse, and visualise statistical information seamlessly for geographies of interest. Geography can be regarded as a tool for integrating data. UN-GGIM has developed a framework for statistical-geospatial integration where common geographies are regarded an important principle (UN-GGIM, 2019).

The NSI can play an important role in providing common geographies to be used by other public and private data providers. For users it is often very difficult to combine data from different sources due to the lack of common geographies. A starting point could be to create an open Geography Web Portal.

#### *Content: Choosing relevant statistical content*

Data sources appropriate for creating local-level statistics are mainly censuses, administrative registers and other data sources where the data have a geographic reference.

The ninth session of UN-GGIM Committee of experts endorsed a global set of fundamental data themes presented in a background paper (UN-GGIM, 2019b). One theme covers population distribution: *Geographical distribution of people, including population characteristics*. The theme is considered fundamental because “it is vital to understand the spatial distribution of the population and its characteristics, as well as how population impacts urbanisation, regional development or sustainability”.

Without data on population distribution, it is not possible to assess the progress from an urban/rural perspective. Local-level statistics on where the population live and where people are at a given time is also highly in demand when preparing for natural disasters or making accessibility assessments. The recommendation is for countries to have population statistics on any geographies available (census tabulation area, city, postal code area, grid etc).

The paper states that “ideally 5-year age cohorts by gender would exist globally, which allow for groupings to include specific at-risk populations, such as elderly, family composition, children, indigenous population, immigrant/ethnic origin, and education. In the absence of such detailed cohorts, estimates of these at-risk populations are needed. Additional demographics include rates of employment, personal income, household income, and living conditions, i.e., the types of materials used for dwelling units”.

Starting to produce local-level statistics often includes integrating different data sources, statistical and geospatial. There are a number of recommendations, guidance and good examples on how to do this in a report from the European project GEOSTAT 2 (GEOSTAT 2, 2017).

#### *Finding a balance between utility and privacy*

The more granular the geospatial data is, the more useful it is for communities, but at the same time the risk to privacy is greater. Finding the balance between confidentiality and utility is a question of both data governance and methodology.

In terms of governance, NSIs need to balance the requirements set out in the UN Fundamental Principles (UN, 2014) to both produce useful statistics that are trusted by citizens and to uphold confidentiality. Adopting an ‘open by default’ approach (Open Data Charter) to open data publication can help to do this. Adopting this approach simply means that “public data should be disclosed unless there is a legitimate reason for it not to be” (Open Data Watch, 2019).

To apply an “open by default” approach to the publication of local-level official statistics, NSIs need to consider their national governance frameworks – from the level of the statistical law governing their activities, down to the internal business processes that are employed within the NSI itself. In terms of governance structures

within NSIs, if government-wide Open Data Policies exist, NSIs should ensure that they adequately reflect their needs and approaches. In EU the Open Data Directive and its implementation in national legislation is part of the governance of open data. If no such policies exist, NSIs should consider drafting a policy that covers their needs.

The next step in the open by default approach will be for NSIs to consider the implications of protecting confidentiality in local-level statistics on their data collection and compilation methodologies. Insee has developed a Handbook of Spatial Analysis (Insee, Eurostat, 2017), where chapter 14 on confidentiality of spatial data provides a very helpful starting point from which tailored approaches can then be further elaborated and developed.

#### *Increased visibility for local-level statistics – increased use*

Official statistics on administrative geographies can often be disseminated without support of a visualisation tool, such as a map. The name of the administrative area might give the user enough information to interpret the numbers. For local-level statistics the user very likely needs to look at the boundaries of different geographies to be able to use the statistics properly.

For NSIs to release local-level statistics as open data the minimum requirement could be put is out as machine-readable data and let others use and re-use the data in various services to users. This imply using existing platforms for data dissemination, not creating parallel tracks and special solutions for publishing statistics at local level. Otherwise, it is easy to end up with separate solutions where files are prepared manually packaged and published on the NSI's website. This is inefficient both from the resource point of view and from the point of view of use.

NSIs can also provide various mapping- and visualisation tools themselves, often developed in collaboration with a geospatial partner (public or private) for increased use and visibility to the local-level statistics. The variety of tools available spans from the simplest visualisation tool where the user can see the boundaries, coloured by for example population density, but with no additional geographical background information – to the most advanced tool where the user has a detailed map with a lot



of geospatial layers (buildings, roads, water etc) and use geospatial queries to a database.

The Global Statistical Geospatial Framework talks about enabling the release of geospatially enabled statistical information in a usable and accessible form. It specifically promotes the use of standard web services and linked data methods to provide dynamic, machine-readable access to these data with the necessary assurances regarding the integrity of the data.

### **3. Results – Adding local-level statistics to Statistics Sweden’s portfolio of official statistics**

Statistics Sweden has benefited from the work done together with partners in the GEOSTAT projects, the UN-GGIM expert group on statistical-geospatial integration and the UN working group on open data when setting up our portfolio of local-level statistics as open data. While other countries had been providing local-level statistics as open data for many years, Statistics Sweden had not – as statistics on a more granular level than municipality had been part of our commissioned services. With open data as a strategic priority there was a need for us to go through the four steps of geography, content, disclosure measures and visualisation options.

#### *Geography: Choosing the right geography for local-level official statistics*

A new geography / territorial division called Demographic statistical areas (DeSO) was designed to fulfil several requirements to be suitable for local-level statistics (SCB, 2019). The DeSO are large enough not to be affected too much by disclosure measures, they are consistent over time, and they aggregate to municipality level covering the whole country. There are 5 984 DeSO, the population differs between approximately 700 and 2 700 inhabitants.

When assessing if other geographies also should be used for official statistics, the conclusion was that urban areas/localities in many places are too like DeSO, which would lead to a risk of disclosure. There are several DeSO and urban areas where only a small number of households differ between the two geographies. Since DeSO, when it was created, was based on urban areas but laid a buffer zone of 600 meters around the urban areas, there are several DeSO where there are occasional populated properties in the buffer zone. These households can then easily be



disclosed if statistics are reported for both divisions. A similar consideration has been not to release statistics on grids together with DeSO, due to the geographical differencing problem.

DeSO has proven very useful also as building blocks for RegSO, another new geography developed as result of a government assignment (SCB, 2020a). There are 3 363 RegSO, most municipalities have between five and nine RegSO. The main purpose of RegSO is to follow-up socio-economic segregation, the geography can also be used to follow-up and evaluate equality targets and integration of immigrants in society. While DeSO is identified only by their code, RegSO has both a designation (“name”) and a code.

#### *Content: Choosing relevant statistical content*

Based on which statistics that has been most in demand as commissioned services a total of 19 tables has been released on Demographic Statistical Areas, DeSO (SCB, 2020b).

The DeSO tables are mainly one-dimensional tables, due to confidentiality, where the user gets one variable (e.g. population by age, sex, civil status, citizenship, country of birth or Swedish/foreign background etc) presented on DeSO areas. The statistics can be used for example to describe inequalities between different local areas, to design national policies targeting areas at risk for increased crime and segregation.

Many DeSO tables are also available on RegSO, but RegSO are mainly used for statistics resulting from the government assignment mentioned earlier, included in “Register data for integration” which can be found in the statistical database. RegSO has been designed to make it possible to have multi-dimensional tables and statics on RegSO cover more subject matter areas than statistics on DeSO.

Table 1 below shows number of external retrievals of statistics on DeSO (and/or RegSO). As DeSO statistics was published in connection with the yearly publishing of statistics on county and municipality level, the month of first release differ. The numbers show the importance of providing machine-readable APIs, so that local-level statistics can be easily re-used in various applications. It is still a bit early to see clear trends in how popular different tables are, this will be something to monitor closely the years ahead.

*Table 1: Number of database and API retrievals*

Statistics on DeSO	First published	Database retrievals		API retrievals	
		2021	2022*	2021	2022*
Population by age and sex (2010 -)	March 2021	3 044	2 669	64 002	13 935
Population by total income or net income as % in quartiles (2011 -)	January 2021	956	1 497	6 777	8 033
Population by net income and sex (2011 -)	January 2021	1 058	1 231	8 640	7 093
Population by educational level (2015 -)	May 2021	893	1 390	3 641	2 217
Population by type of real estate (2012 -)	April 2021	232	274	1 052	1 984
Population by Swedish/foreign background and sex (2010 -)	March 2021	964	1 426	3 769	1 883
Households by type of household (2011 -)	March 2021	652	505	2 356	1 764
Population by high/low disposable income and sex (2011 -)	May 2021	765	893	843	1 698
Population by sex (2010 -)	March 2021	302	278	833	1 324
Dwellings by form of tenure (2015 -)	April 2020	812	519	3 540	1 316
Population by disposable income as % in quartiles (2011 -)	January 2021	658	512	4 177	1 258
Population by citizenship and sex (2010 -)	March 2021	229	245	1 348	1 183
Passenger cars by status (2015 -)	December 2020	51	823	76	1 028
Population by type of tenure (2012 -)	April 2021	225	190	721	957
Population by civil status and sex (2010 -)	March 2021	138	133	2 230	915
Population by region of birth and sex (2010 -)	March 2021	250	302	1 992	870
Population by employment and sex (2018 -)	November 2020	352	161	3 328	864
Foreign-born gainfully employed by age as % of total population (2018 -)	November 2020	368	144	951	437
Gainfully employed by region of birth (2018 -)	November 2020	274	92	1 047	435
<b>TOTAL</b>		12 223	13 284	111 323	49 194

\* Numbers for January-June 2022

### *Finding a balance between utility and privacy*

DeSO, was designed to be suitable from a confidentiality perspective and Sweden's 290 municipalities were divided in 5 984 DeSO areas. On average the DeSO population is about 9 times smaller than a municipality. The median DeSO 2018 had just over 1 700 inhabitants, while the average municipality had just over 16 000. The lowest number of inhabitants in a DeSO is approximately 700, the smallest DeSO to the surface covers about three blocks and is about 150 x 150 meters. In summary, this means that Statistics Sweden could not publish statistics on DeSO to the same extent as we do for municipalities.

There is a need to limit different combinations of data, as the population is reduced rapidly if users get cross-tabulated data, which then increases the risk of identifying specific individuals. As shown in the table above, most tables are either one-dimensional – or include sex as a second variable.

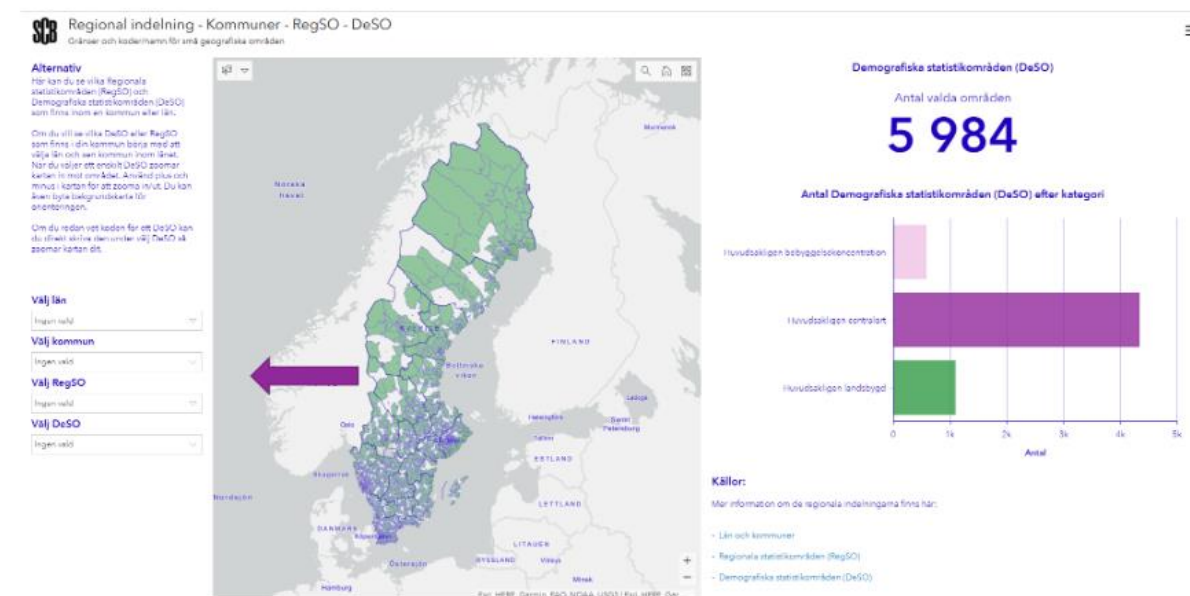
Statistics based on administrative registers, as in our case, do not have the same uncertainty and, consequently, extra protection that sample-based statistics have. A user may have knowledge of which objects are included in the production of the

statistics, which cannot be assumed in the same way for sample-based statistics. Geographical location generally facilitate identification.

Statistics Sweden has traditionally used suppression as method for disclosure control, but is currently exploring other methods – the most promising being the Cell Key Method, which will also be used for census statistics in the 2021 European population and housing census (Eurostat, 2022). It remains to put the method in practical operations supported by a suitable tool.

### *Increased visibility for local-level statistics – increased use*

Local-level statistics often need to be used together with a map, especially – as in the case of DeSO – when the geography is not commonly known, and the geographic areas are identified only by a code.



*Figure 3: Information on regional divisions: municipalities, RegSO and DeSO (SCB-GIS).*

Statistics Sweden so far offers a few services to users, such as the example in figure 3 or the Regina map service (SCB-REGINA). With easy access and generous open data licencing (CC0) the uptake, use and reuse of DeSO statistics and their geographies on local, regional and national level is growing.

### *General open data developments*

In 2021 we were able to provide the national data portal with automatically harvested metadata from the statistical database on a dataset level and transformed them to a DCAT-AP format. Statistics Sweden is the agency with the highest number of searchable datasets on the portal, approximately 4 900 in June 2022.

In 2021 we also decided to differentiate our licensing of open data. We changed from Creative Commons BY, CC.BY, to Creative Commons zero, CC0, for all machine-readable open data, while keeping CC.BY for our reports and written analysis and visualizations (Creative Commons, 2022). CC0 is a so-called public domain dedication which allows creators to give up their copyright and put their works into the worldwide public domain. CC0 allows reusers to distribute, remix, adapt, and build upon the material in any medium or format, with no conditions. This enables flexible use of our open data by Wikimedia and others and makes official statistics easier to find on Google.

#### **4. Discussion and next steps**

The results presented in this paper would not have been possible to accomplish without strategic goals and re-allocation of appropriations, dedicated experts, international and national benchmark. There are still some issues to solve, such as deciding on a more sustainable mapping service and having improved APIs, but mainly the next step will be to increase the reuse of what has been published and engage with other statistical agencies so that users can find all official statistics as open data.

Knowing more on **use of open data** might sometimes be a challenge, as you should avoid asking for any registration from API users (DIGG, 2020). But there are other ways of user engagement, the UN Working group on open data provide a number of national examples on reuse of local-level statistics as open data (UN, 2022).

Statistics Sweden showcased working with a news agency, Newsworthy, that sets up automated news with a local angle built on open data.

The Agency for Digital Government, DIGG, is leading the work on how to establish a **digital arena**, as part of government assignment under the umbrella of the national data strategy. Statistics Sweden and other statistical agencies will benefit from the

arena, where the idea is to create a forum for producers and users of data. The more concrete work will start during autumn 2022.

Providing official statistics as easily reusable open data is an important aspect of **data stewardship**, where the NSI is one actor of many in the national data ecosystem. For Statistics Sweden this means that we work closely with DIGG as well as with the other statistical agencies in the national statistical system, NSS (Haldorson M, Strandberg K, Erikson J, 2022).

Statistics Sweden also has a government assignment linked to the national data strategy on “**Data for smart statistics**”, which includes making it mandatory for all statistical agencies to have their official statistics findable and reusable through the national data portal. Statistics Sweden will issue a new regulation as part of our coordinating mandate for the NSS, planned to enter into force in January 2024.

Moving forward we will also make the most of our open data by reusing what is published in the statistical database in other formats on our website, with **automatic updates** via API. One such example which is working already is “Municipalities in numbers”, where the user can compare two municipalities and the statistics gets updated automatically.

On our journey of open data, we are now moving towards what can be described as the third wave of open data, which is to “**publish with purpose**” by better understanding how our open data is being used (Verhulst S et al., 2020). While the first wave was making data available on request and the second wave having an “open by default” approach – the third wave focus on to create value from open data by making it known and used.

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